Stormwater Pollutant Calculation
Calculation table

Surface type	Runoff coefficient	Annual runoff depth	Annual Stormwater runoff volume	Pollutant load: TSS	Pollutant load: TP
Pavement/ rooftop	.98				
Turfgrass	.25				
Gravel/ baseball field	.4				
Tree cover	.15				
Open space	.20				
TOTALS	—				
Custom total #1	--				
Custom total #2	—				

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Equation descriptions

1. Annual runoff depth

$$D_r = P \times P_j \times R_v$$

D_r = Annual runoff depth (in)

P = Total annual rainfall depth (in)

Found on websites like USclimatedata.com. Saint Paul's average is 32.01"

P_j = Fraction of annual rainfall events that produce runoff (.9).

Obtained by the runoff reduction method created by the Center for Watershed Protection, 2008. Consistently setting this at .9 is recommended by the Minnesota Pollution Control Agency.

R_v = Runoff coefficient

2. Annual stormwater runoff volume:

$$R = D_r \times A \times 3{,}630$$

R = Annual stormwater runoff volume (ft^3)

D_r = Annual runoff depth (in)

A = Surface area of landuse in acres

1 acre=43,560 ft^2

3,630 = Conversion factor to convert the final result into cubic feet.

3. Pollutant loads

$$L = R \times C \times 6.243 \times 10^{-5}$$

L = Pollutant load (lb)

R = Annual stormwater runoff volume (ft^3)

C = Average annual polltant concentration in mg/l

Calculate each landuse surface for total suspended solids (TSS) and total phosphorous (TP). TSS: 54.5 mg/L TP: 0.3 mg/L Average concentrations provided by the Minnesota Pollution Control Agency

6.243×10^{-5} = Conversion factor to convert the final result into lbs.

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Reflection questions

1. A. Which surfaces shed the most pollutants? Are these also the surfaces with the most surface area, or the surfaces that generate the most runoff?

   B. Create two custom totals, each adjusting the acreage (A) of one of the landuse surfaces—you choose which surface to adjust. Make the acreage either larger or smaller, keeping the runoff coefficient the same. How does an adjustment for that surface cover effect the pollutant load—for better or worse, and why?

2. How do total annual rainfall and the runoff coefficient effect annual runoff depth? What would it take to maintain a low annual runoff if a site had high annual rainfall and a high runoff coefficient? What if there was a high annual rainfall and a low runoff coefficient?

3. Describe the problems and assets for each region of the schoolyard (N/S/E/W). Balancing these problems and assets, where would a water quality project be placed to have the greatest impact on water quality?

4. After analyzing your schoolyard, what strategies do you think the building planners had in terms of runoff? Would you have done anything differently?